Claims

What is claimed is:

Sub a1

1. A computer-implemented method for identifying hidden and visible surfaces on an n-dimensional object, wherein n is greater than 1, said method comprising:

generating an n-dimensional image of an object, said image including a first plurality of n-dimensional components that define a shape and orientation of the image and a plurality of parts located inside the image;

superimposing an n-dimensional grid of pixels on said image, said pixels arranged in a lattice structure such that each pixel of said grid corresponds to one of a plurality of vertices of an m-sided cell, wherein each side of said m-sided cell includes at least four vertices; and

identifying a second plurality of n-dimensional components located on an outer perimeter of said image that abut or overlap at least one side of one m-sided cell in said grid.

2. The method of claim 1, wherein m is two times n.

3. The method of claim 1, further including the step of rendering an n-dimensional image including the second plurality of n-dimensional components.

4. The method of claim 1, wherein said identifying further includes:

starting at a predetermined location inside the grid and outside the image;

identifying a set of vertices corresponding to the sides of an untested m-sided cell;

testing each side of the untested cell to determine when an n-dimensional component abuts or overlaps at least one side of the m-sided cell;

storing an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said m-sided cell; and

repeating the identifying, testing, and storing steps for every m-sided cell located inside the grid and outside the perimeter of the image.

5. The method of claim 1, wherein said identifying further includes:

identifying a location where the image abuts or overlaps at least one side of an m-sided cell;

storing an identifier of each n-dimensional component in the image associated with the location; and

repeating the identifying, testing, and storing steps for every location where the image abuts or overlaps at least one side of an m-sided cell.

6. The method of claim 4, wherein said storing further includes:

identifying a plurality of m-sided cells adjacent to said m-sided cell when the n-dimensional component does not abut or overlap at least one side of said m-sided cell; and

for each of said plurality of adjacent m-sided cells, storing an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said adjacent m-sided cells.

7. The method of claim 1, wherein spacing between successive pixels is a user inputted value.

8. The method of claim 1, wherein said n-dimensional grid is comprised of a plurality of m-sided cells.

9. The method of claim 8, wherein an outer boundary of said grid is separated from the outer perimeter of said image by at least one row of m-sided cells.

10. An apparatus for identifying hidden and visible surfaces on an n-dimensional object, wherein n is greater than 1, said apparatus comprising:

a network device having a memory containing a program that further includes:

a module for generating an n-dimensional image of an object, said image including a first plurality of n-dimensional components that define a shape and orientation of the image and a plurality of parts located inside the image;

a module for superimposing an n-dimensional grid of pixels on said image, said pixels arranged in a lattice structure such that each pixel of said grid corresponds to one of a plurality of vertices of an m-sided cell, wherein each side of said m-sided cell includes of at least four vertices; and

a module for identifying a second plurality of n-dimensional components located on an outer perimeter of said image that abut or overlap at least one side of one m-sided cell in said grid.

11. The apparatus of claim 10, wherein m is two times n.

12. The apparatus of claim 10, further including a module for rendering an n-dimensional image including the second plurality of n-dimensional components.

13. The apparatus of claim 10, wherein said module for identifying further includes the capability to:

start at a predetermined location inside the grid and outside the image;

identify a set of vertices corresponding to the sides of an untested m-sided cell;

test each side of the untested cell to determine when an n-dimensional component abuts or overlaps at least one side of said m-sided cell;

store an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said m-sided cell; and

repeat the identifying, testing and storing steps for every m-sided cell located inside the grid and outside the perimeter of the image.

14. The apparatus of claim 10, wherein said module for identifying further includes the capability to:

identify a location where the image abuts or overlaps at least one side of an m-sided cell;

store an identifier of each n-dimensional component in the image associated with the location; and

repeat the identifying and storing steps for every location where the image abuts or overlaps at least one side of an m-sided cell.

15. The apparatus of claim 13, wherein said module for storing further includes the capability to:

identify a plurality of m-sided cells adjacent to said m-sided cell when the n-dimensional component does not abut or overlap at least one side of said m-sided cell;

for each of said plurality of adjacent m-sided cells, store an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said adjacent m-sided cells.

16. The apparatus of claim 10, further including the capability for a user to modify spacing between successive pixels.

17. The apparatus of claim 10, wherein said n-dimensional grid includes a plurality of m-sided cells.

18. The apparatus of claim 17, wherein an outer boundary of said grid is separated from the outer perimeter of said image by at least one row of m-sided cells.

19. A machine-readable storage medium having stored thereon machine executable instructions, the execution of said instructions adapted to implement a method for identifying hidden and visible surfaces on an n-dimensional object, wherein n is greater than 1, said method comprising:

generating an n-dimensional image of an object, said image including a first plurality of n-dimensional components that define a shape and orientation of the image and a plurality of parts located inside the image;

superimposing an n-dimensional grid of pixels on said image, said pixels arranged in a lattice structure such that each pixel of said grid corresponds to one of a plurality of vertices in an m-sided cell, wherein each side of said m-sided cell includes at least four vertices; and

identifying a second plurality of n-dimensional components located on an outer perimeter of said image that abut or overlap at least one side of one m-sided cell in said grid.

20. The machine-readable storage medium of claim 19, wherein m is two times n.

21. The machine-readable storage medium of claim 19, further including the step of rendering an n-dimensional image of the second plurality of n-dimensional components.

22. The machine-readable storage medium of claim 19, wherein said identifying further includes:

starting at a predetermined location inside the grid and outside the image;

identifying a set of vertices corresponding to the sides of an untested m-sided cell;

testing each side of the untested cell to determine whether an n-dimensional component abuts or overlaps at least one side of said m-sided cell;

storing an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said m-sided cell; and

repeating the identifying, testing and storing steps for every m-sided cell located inside the grid and outside the perimeter of the image.

23. The machine-readable storage medium of claim 19, wherein said identifying further includes:

identifying a location where the image abuts or overlaps at least one side of an m-sided cell;

storing an identifier of each n-dimensional component in the image associated with the location; and

repeating the identifying and storing steps for every location where the image abuts or overlaps at least one side of an m-sided cell.

24. The machine-readable storage medium of claim 22, wherein said storing further includes:

identifying a plurality of m-sided cells adjacent to said m-sided cell when the n-dimensional component does not abut or overlap at least one side of said m-sided cell; and

for each of said plurality of adjacent m-sided cells, storing an identifier of an n-dimensional component when the n-dimensional component abuts or overlaps at least one side of said adjacent m-sided cells.

25. The machine-readable storage medium of claim 19, wherein spacing between successive pixels.

26. The machine-readable storage medium of claim 19, wherein said n-dimensional grid includes a plurality of m-sided cells.

27. The machine-readable storage medium of claim 26, wherein an outer boundary of said grid is separated from the outer perimeter of said image by at least one row of m-sided cells.